

4. Cold-rolled carbon steel

4.4. COLD-ROLLED MICRO-ALLOYED STEEL FOR ENAMELLING AND STAMPING

Table 4.10. Mechanical properties

Steel grade	Standard	Tensile strength, N/mm ²	Yield point, N/mm ²	Elongation, %, min***	Application
06FBYuAR*	TU 14-106-608-2000	260–350	210 max	32–38	For single- and double-layer enamelling
06FBYuAR*	TU 14-106-607-2000	260–360	240 max	32–36	For single- and double-layer enamelling
07GFYu	TU 14-106-633-2001	390 min	275 min	30	Steel micro-alloyed with vanadium (0,04–0,08%) for automotive parts
06FYu	TU 14-106-661-2002	340 min	240 min	30	For cold stamping automotive parts
DC01EK	EN 10209	270–390	270 max	30	Steel for single- and double-layer enamelling, microalloyed with boron (0,001–0,003%)
DC04EK	EN 10209	270–350	220 max	36	
ZStE220BH (HC220B)	SEW 094 (EN 10268)	320–400 (320–400)	220–280 (220–270)	30 (32)	For forming with subsequent hardening during drying (BH-effect)
ZStE260BH (HC260B)	SEW 094 (EN 10268)	360–440 (360–440)	260–320 (260–320)	28 (29)	
HC260LA (ZStE260)	EN 10268 (SEW 093)	340–420 (350–450)	240–310 (260–340)	27 (24)	
HC300LA (ZStE300)	EN 10268 (SEW 093)	370–470 (380–480)	280–360 (300–380)	24 (22)	Micro-alloyed steel for cold forming
HC340LA (ZStE340)	EN 10268 (SEW 093)	400–500 (410–530)	320–410 (340–440)	22 (20)	
HC380LA (ZStE380)	EN 10268 (SEW 093)	430–550 (460–600)	360–460 (380–500)	20 (18)	
HC420LA (ZStE420)	EN 10268 (SEW 093)	460–580 (480–620)	400–500 (420–540)	18 (16)	
HC220P ZStE220P	EN 10268 SEW 094	320–400 340–420	220–270 220–280	32 30	Steel for cold forming microalloyed with phosphorous
HC260P ZStE260P	EN 10268 SEW 094	360–440 380–460	260–320 260–320	29 28	
HC300P ZStE300P	EN 10268 SEW 094	400–480 420–500	300–360 300–360	26 26	
HCT500X (H300X)	EN 10336 (SEW 097)	500 min (500 min)	300–380 (300–370)	23 (24)	Duplex steel for cold forming
HCT600X (H340X)	EN 10336 (SEW 097)	600 min (600 min)	340–420 (340–410)	20 (20)	

* — for rolled steel with thickness less than 0.7 mm increase in the yield point value up to 240 N/mm² is permissible.

** — for rolled steel with thickness of less than 0.7 mm increase in the yield point value up to 260 N/mm² is permissible.

*** — for rolled steel with thickness ≤ 0,7 mm and > 0,5 mm decrease in elongation by 2% is permissible.

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For steel grades HC260LA, HC300LA, HC340LA mandrel diameter during bending test at 180° — $0a$, for HC380LA, HC420LA — $0.5a$, a – strip thickness.

For rolled flats grades HCT500X, HCT600X product mix $(0,7-2,0) \times (\leq 1500)$ mm.

For rolled flats grade HC420LA product mix $(1,0-2,5) \times (\leq 1300)$ mm.

For grades DC01EK, DC04EK:

- 1) mechanical properties apply to skin-passed products only.
- 2) with thickness of less or equal to 0.7 mm and more than 0.5 mm the yield point value is increased by 20 N/mm^2 . With thickness of less or equal to 0.5 mm the value is increased by 40 N/mm^2 .
- 3) yield point lower limit may be assumed as equal to 140 N/mm^2 .
- 4) with thickness of less or equal to 0.7 mm and more than 0.5 mm minimum elongation value is decreased by 2 points. With thickness of less or equal to 0.5 mm the minimum value is decreased by 4 points.
- 5) on customer's demand rolled steel grade DC04EK may be supplied with yield point not more than 210 N/mm^2 and elongation of not less than 38% with 0.7–1.5 mm thickness. Surface roughness in the normal roughness range shall be selected by the manufacturer.

Rolled steel may be produced with special mechanical properties on demand by customer.

Micro-alloying ensures:

- in steels for enameling — improved resistance to “fish scale” defect.
- in steels for cold stamping of automotive parts — excellent ductility properties in combination with improved strength
- Rolled steel thickness: 0.5–2.5 mm.